

REMARKS

I. Introduction

In response to the pending Office Action, Applicants have amended claim 107 in order to further clarify the subject matter of the present invention and to overcome the § 112 rejections. Support for the amendment to claim 107 may be found, for example, in original claim 108. No new matter has been added.

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art.

II. The Rejection Of Claim 107 Under 35 U.S.C. § 103

Claim 107 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Fuller et al. (USP No. 6,068,941) in view of JP 2003/229156 and over Fuller in view of JP 11-67252. Applicants respectfully traverse these rejections for at least the following reasons.

Amended claim 107 recites a method for operating a fuel cell...comprising the steps of carrying out a restoring operation including: (A) operating the fuel cell while feeding the oxygen-containing gas to the cathode, (B) terminating feeding of the oxygen-containing gas to the cathode, and (C) feeding a hydrocarbon gas that is a city gas desulfurized with a desulfurizer, a propane gas or a butane gas to the cathode instead of the oxygen-containing gas which has been fed to the cathode, to decrease a potential of the cathode after terminating feeding of the oxygen-containing gas to the cathode.

One feature of the present disclosure is that the feeding of the oxygen-containing gas is terminated and then the hydrocarbon gas is fed instead of the oxygen-containing gas. In contrast, Fuller teaches that alcohol is introduced to the coolant circuit at the time of shut-down, but does

not describe whether or not the alcohol is introduced after the termination of the feeding of the air (oxygen containing gas). In addition, Fuller teaches that air is fed to the cathode at the time of start-up. As such, it is clear that Fuller fails to disclose the steps of terminating feeding of the oxygen-containing gas to the cathode and feeding a hydrocarbon gas that is a city gas, a propane gas or a butane gas to the cathode instead of the oxygen-containing gas after terminating feeding of the oxygen-containing gas to the cathode.

Another feature of claim 107 is that a hydrocarbon gas is fed to the cathode. It is admitted that Fuller fails to disclose feeding a hydrocarbon gas to the cathode. However, it is alleged that references JP 2003/229156 and JP 11-67252 each disclose this feature. However, as is clearly shown in the English translation of JP 2003/229156, the city gas is fed to the anode, not the cathode. Specifically, JP '156 describes in paragraph [0030] that the city gas is used as a purge gas, and the fuel feeding passage extending from the reformer to the fuel cell is used to feed the city gas to the anode. A machine translation of JP 2003-229156 into English is included with this Amendment and labeled Attachment 1. In addition, the diagram of the power generating system as shown in Fig. 1 of JP '156 fails to show a passage extending from the reformer to the cathode of the fuel cell. Accordingly, it is clear that JP '156 fails to teach or suggest that a hydrocarbon gas is fed to the cathode.

Another feature of claim 107 is that the hydrocarbon gas is fed as a replacement gas for the oxygen gas. It is alleged that JP '252 discloses this feature. However, JP '252 discloses that the combustion exhaust gas is used as a purge gas to purge the fuel cell. Exhaust gas of reformed city gas contains, as its major component, carbon dioxide - the result of combusting hydrocarbon gas. As such, exhaust gas, which is not considered "city gas" by those skilled in the art, is not a hydrocarbon gas. Accordingly, it is clear that JP '252 fails to teach the step of claim 107 of

feeding a hydrocarbon gas that is a city gas, a propane gas or a butane gas to the cathode instead of the oxygen-containing gas after terminating feeding of the oxygen-containing gas to the cathode.

In addition, the Office Action states that Fuller discloses feeding methanol or ethanol into the coolant passages during shutdown, and feeding air to the cathode so that alcohol diffusing to the cathode catalyst is oxidized. Thus, it is alleged that because the alcohol diffuses to the catalyst, it is “introduced into the fuel cell upon shutdown thereof. Therefore, there is a presence of such a hydrocarbon-based material in the cathode upon shutdown of the fuel cell”.

However, Fuller clearly states that the low molecular weight alcohol is fed into the coolant channel of the fuel cell, and warming the fuel cell, upon start-up, by flowing a controlled amount of air into the normal process oxidant channel on the cathode side of the fuel cell, the methanol diffusing to the cathode catalyst where it reacts with air to produce heat, thereby to warm the fuel cell to a temperature at which fuel cell operation (see, col. 1, lines 4-12). As such, if one were to substitute the alcohol of Fuller with the city gas of JP ‘156 or JP ‘252, one would not obtain the desired effect of warming up the fuel cell, as putting a gas in the coolant channel would cause irregular flow of the coolant and prevent the coolant channel from operating.

Furthermore, a hydrocarbon-based material is not the same as a hydrocarbon gas. Claim 107 requires a hydrocarbon gas that is a city gas desulfurized with a desulfurizer, a propane gas or a butane gas. None of these gasses contain methanol or ethanol. Moreover, alcohols such as methanol and ethanol contain oxygen. As claim 107 recites a step of feeding a hydrocarbon gas ...instead of the oxygen-containing gas which has been fed to the cathode, it is clear that the alcohol of Fuller is not equivalent to the hydrocarbon gas of claim 107. Accordingly, the

combination of Fuller and JP '156 or JP '252 is improper, as even if one were to combine the fuel gas of JP '156 or JP '252 with the apparatus of Fuller, one would still not obtain a step of feeding a hydrocarbon gas that is a city gas desulfurized with a desulfurizer, a propane gas or a butane gas to the cathode instead of the oxygen-containing gas which has been fed to the cathode, because the alcohol, which contains oxygen, would still be fed to the cathode, as admitted by the Examiner.

In order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. As Fuller and both JP 2003/229156 and JP 11-67252, at a minimum, fail to describe a method for operating a fuel cell...comprising the steps of carrying out a restoring operation including: (A) operating the fuel cell while feeding the oxygen-containing gas to the cathode, (B) terminating feeding of the oxygen-containing gas to the cathode, and (C) feeding a hydrocarbon gas that is a city gas desulfurized with a desulfurizer, a propane gas or a butane gas to the cathode instead of the oxygen-containing gas which has been fed to the cathode, to decrease a potential of the cathode after terminating feeding of the oxygen-containing gas to the cathode, it is submitted Fuller, JP 2003/229156 and JP 11-67252, alone or in combination, do not render claim 107 obvious. Accordingly, it is respectfully requested that the § 103 rejection of claim 107 be withdrawn.

III. Conclusion

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication of which is respectfully solicited.

Application No.: 10/696,505

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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